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The present invention includes devices and methods that form a plasma from process exhaust or other gas. More particularly, a plasma source is provided that is coupled to a spectrographic analyzer. Further aspects of the present invention are described in the specification and defined in the claims.

In the Claims:

Please delete claims 1-19 as originally filed, and add the following new claims 20-43 as set forth below:

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20. A plasma analysis device for analyzing a gaseous sample within a plasma chamber, including:

a plasma chamber;

an exhaust gas feed gaseously coupled to the plasma chamber;

a radio frequency power oscillator, disposed outside the plasma chamber, electromagnetically coupled to a space within the chamber;

an optical window into the plasma chamber;

a spectral analyzer comprising a grating and a detector array, optically coupled to the optical window.

21. The device of claim 20, wherein the plasma chamber is dedicated to generation of plasma light emissions for spectral analysis.

22. The device of claim 20, wherein the gaseous coupling allows diffusion of gas from the exhaust gas feed to the plasma chamber.

23. The device of claim 20, wherein the gaseous coupling allows flow of gas from the exhaust gas feed into the plasma chamber.

24. The device of claim 20, wherein the chamber operates at a gas pressure of 100 mtorr to 10 torr.

25. The device of claim 20, wherein the radio frequency power oscillator is adjustable to vary plasma light intensity, independent of any process upstream of the exhaust gas feed.

26. The device of claim 22, wherein the radio frequency power oscillator is adjustable to vary plasma light intensity, independent of any control changes to a process upstream of the channel.

27. The device of claim 20, wherein the optical window comprises sapphire.

28. The device of claim 25, wherein the optical window comprises sapphire.

29. The device of claim 26, wherein the optical window comprises sapphire.

30. The device of claim 20, wherein the optical window transmits light from approximately 200 nm to near infrared.

31. The device of claim 25, wherein the optical window transmits light from approximately 200 nm to near infrared.

32. The device of claim 26, wherein the optical window transmits light from approximately 200 nm to near infrared.

33. The device of claim 20, wherein optical coupling of the spectral analyzer and the optical window comprises a lens and light guide.

34. The device of claim 20, wherein the radio frequency power oscillator comprises a single resonant circuit including at least one induction coil and one or more tuning capacitors, and the induction coil and the tuning capacitors are in parallel.

35. The device of claim 20, wherein the radio frequency power oscillator matches impedance with the gas before and after ignition of the gas to a plasma state.

36. The device of claim 20, wherein ignition of the gas to a plasma state does not require any electrodes internal to the plasma chamber.

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37. The device of claim 35, wherein ignition of the gas to a plasma state does not require any electrodes internal to the plasma chamber.

38. The device of claim 20, further including:

a computer, electronically coupled to the detector array; and

logic and resources to monitor the detector array for signal changes.

39. The device of claim 38, wherein the logic and resources generate a control signal, further including:

process equipment gaseously coupled to the exhaust gas feed; and

process control equipment, operatively connected to the process equipment, in communication with the logic and resources.

40. The device of claim 39, wherein the logic and resources generate a process end signal when a process is out of bounds.

41. The device of claim 39, wherein the logic and resources generate a process end signal when a process is complete.

42. The device of claim 39, wherein the logic and resources generate a process initiate signal.

43. The device of claim 38, wherein the logic and resources record operating conditions.